

spherical spreading and duration from the off-reference altitude.

(c) The adjustment for the difference between reference airspeed and adjusted reference airspeed is calculated from:

$$<\text{delta}>J_3 = 10 \log_{10}(V_{RA}/V_R) \text{ dB};$$

Where  $<\text{delta}>J_3$  is the quantity in decibels that must be algebraically added to the measured SEL noise level to correct for the influence of the adjustment of the reference airspeed on the duration of the measured flyover event as perceived at the noise measurement station,  $V_R$  is the reference airspeed as prescribed under section J36.3.(c) of this appendix, and  $V_{RA}$  is the adjusted reference airspeed as prescribed under section J36.105(c) of this appendix.

(d) No correction for source noise during the flyover other than the variation of source noise accounted for by the adjustment of the reference airspeed prescribed for under section J36.105(c) of this appendix need be applied.

(e) No correction for the difference between the reference ground speed and the actual ground speed need be applied.

(f) No correction for off-reference atmospheric attenuation need be applied.

(g) The SEL adjustments must be less than 2.0 dB(A) for differences between test and reference flight procedures prescribed under section J36.105 of this appendix unless a larger adjustment value is approved by the FAA.

(h) All data used and calculations performed under this section must be documented and provided under the reporting requirements specified under section J36.111 of this appendix.

#### PART D—NOISE LIMITS PROCEDURE UNDER § 36.805

##### *Section J36.301 Noise Measurement, Evaluation, and Calculation.*

Compliance with this part of this appendix must be shown with noise levels measured, evaluated, and calculated as prescribed under parts B and C of this appendix.

##### *Section J36.303 [Reserved]*

##### *Section J36.305 Noise Limits.*

For compliance with this appendix, the calculated noise levels of the helicopter, at the measuring point described in section J36.101 of this appendix, must be shown to not exceed the following (with appropriate interpolation between weights):

(a) For primary, normal, transport, and restricted category helicopters having a maximum certificated takeoff weight of not more than 7,000 pounds that are noise tested under this appendix, the Stage 2 noise limit is 82 decibels SEL for helicopters up to 1,737 pounds maximum certificated takeoff weight at which the noise certification is requested,

and increasing at a rate of 3.0 decibels per doubling of weight thereafter. The limit may be calculated by the equation:  $L_{AE}(\text{limit}) = 82 + 3.0 [\log_{10}(\text{MTOW}/1737)/\log_{10}(2)]$  dB, where MTOW is the maximum takeoff weight, in pounds, for which certification under this appendix is requested.

(b) The procedures required in this amendment shall be done in accordance with the International Electrotechnical Commission IEC Publication No. 804, entitled “Integrating-averaging Sound Level Meters,” First Edition, dated 1985. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the Bureau Central de la Commission Electrotechnique Internationale, 1, rue de Varembe, Geneva, Switzerland or the American National Standard Institute, 1430 Broadway, New York City, New York 10018, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

[Doc. No. 26910, 57 FR 42855, Sept. 16, 1992, as amended by Amdt. 36–20, 57 FR 46243, Oct. 7, 1992; 69 FR 18803, Apr. 9, 2004; Amdt. 36–25, 69 FR 31234, June 2, 2004]

#### APPENDIX K TO PART 36—NOISE REQUIREMENTS FOR TILTROTORS UNDER SUBPART K

##### *K1 General*

##### *K2 Noise Evaluation Measure*

##### *K3 Noise Measurement Reference Points*

##### *K4 Noise Limits*

##### *K5 Trade-offs*

##### *K6 Noise Certification Reference Procedures*

##### *K7 Test Procedures*

##### *Section K1 General*

This appendix prescribes noise limits and procedures for measuring noise and adjusting the data to standard conditions for tiltrotors as specified in § 36.1 of this part.

##### *Section K2 Noise Evaluation Measure*

The noise evaluation measure is the effective perceived noise level in EPNdB, to be calculated in accordance with section A36.4 of Appendix A to this part, except corrections for spectral irregularities must be determined using the 50 Hz sound pressure level found in section H36.201 of Appendix H to this part.

##### *Section K3 Noise Measurement Reference Points*

The following noise reference points must be used when demonstrating tiltrotor compliance with section K6 (Noise Certification

Reference Procedures) and section K7 (Test Procedures) of this appendix:

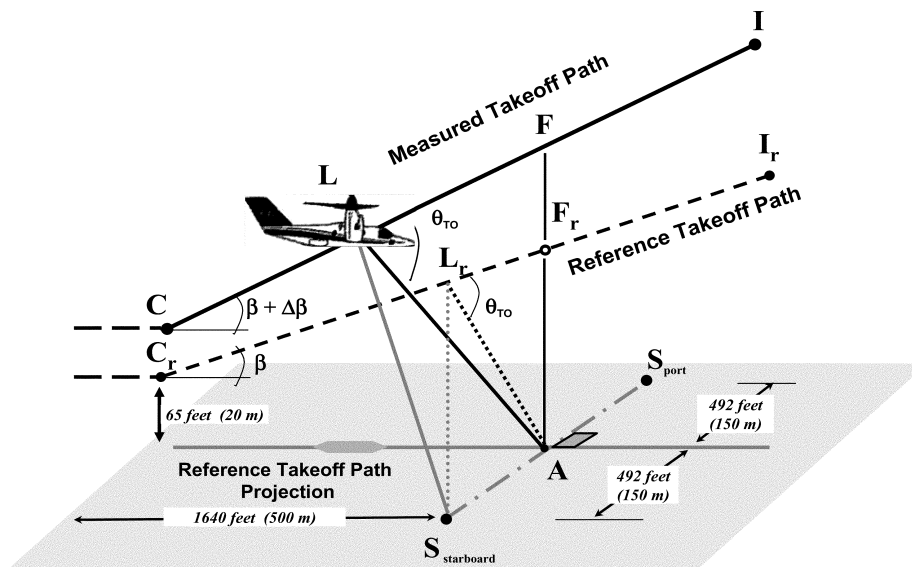
(a) *Takeoff reference noise measurement points—*

As shown in Figure K1 below:

(1) The centerline noise measurement flight path reference point, designated A, is located on the ground vertically below the reference takeoff flight path. The measurement point is located 1,640 feet (500 m) in the horizontal direction of flight from the point

Cr where transition to climbing flight is initiated, as described in section K6.2 of this appendix;

(2) Two sideline noise measurement points, designated as S(starboard) and S(port), are located on the ground perpendicular to and symmetrically stationed at 492 feet (150 m) on each side of the takeoff reference flight path. The measurement points bisect the centerline flight path reference point A.



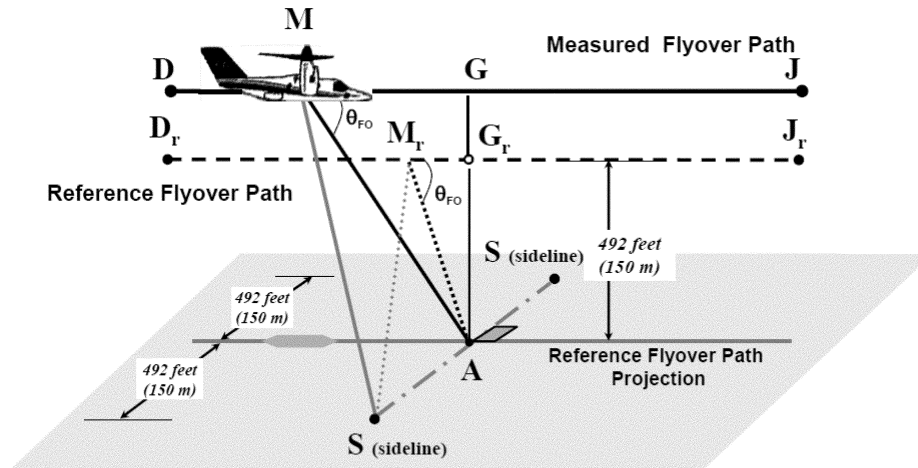
**Figure K1.**  
**Comparison of Measured and Reference Takeoff Profiles**

(b) *Flyover reference noise measurement points—*

As shown in Figure K2 below:

(1) The centerline noise measurement flight path reference point, designated A, is

located on the ground 492 feet (150 m) vertically below the reference flyover flight path. The measurement point is defined by the flyover reference procedure in section K6.3 of this appendix;



**Figure K2.**  
**Comparison of Measured and Reference Flyover Profiles**

(2) Two sideline noise measurement points, designated as  $S_{\text{(sideline)}}$ , are located on the ground perpendicular to and symmetrically stationed at 492 feet (150 m) on each side of the flyover reference flight path. The measurement points bisect the centerline flight path reference point A.

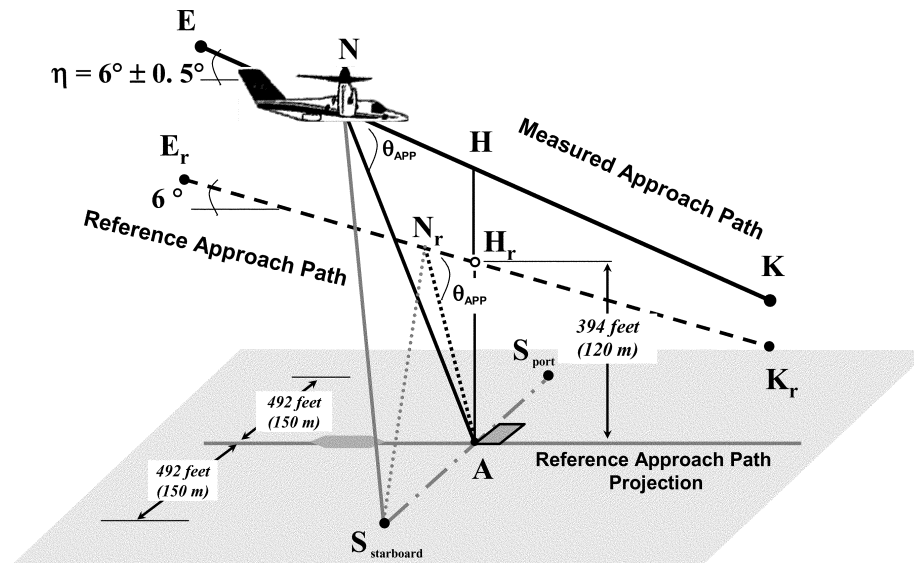
(c) *Approach reference noise measurement points—*

As shown in Figure K3 below:

(1) The centerline noise measurement flight path reference point, designated A, is located on the ground 394 feet (120 m) vertically below the reference approach

flight path. The measurement point is defined by the approach reference procedure in section K6.4 of this appendix. On level ground, the measurement point corresponds to a position 3,740 feet (1,140 m) from the intersection of the 6.0 degree approach path with the ground plane;

(2) Two sideline noise measurement points, designated as  $S_{\text{(starboard)}}$  and  $S_{\text{(port)}}$ , are located on the ground perpendicular to and symmetrically stationed at 492 feet (150 m) on each side of the approach reference flight path. The measurement points bisect the centerline flight path reference point A.



**Figure K3.**  
**Comparison of Measured and Reference Approach Profiles**

#### *Section K4 Noise Limits*

For a tiltrotor, the maximum noise levels, as determined in accordance with the noise evaluation in EPNdB and calculation method described in section H36.201 of Appendix H of this part, must not exceed the noise limits as follows:

(a) *At the takeoff flight path reference point:* For a tiltrotor having a maximum certificated takeoff weight (mass) of 176,370 pounds (80,000 kg) or more, in VTOL/Conversion mode, 109 EPNdB, decreasing linearly with the logarithm of the tiltrotor weight (mass) at a rate of 3.0 EPNdB per halving of weight (mass) down to 89 EPNdB, after which the limit is constant. Figure K4 illustrates the takeoff noise limit as a solid line.

(b) *At the Flyover path reference point:* For a tiltrotor having a maximum certificated

takeoff weight (mass) of 176,370 pounds (80,000 kg) or more, in VTOL/Conversion mode, 108 EPNdB, decreasing linearly with the logarithm of the tiltrotor weight (mass) at a rate of 3.0 EPNdB per halving of weight (mass) down to 88 EPNdB, after which the limit is constant. Figure K4 illustrates the flyover noise limit as a dashed line.

(c) *At the approach flight path reference point:* For a tiltrotor having a maximum certificated takeoff weight (mass) of 176,370 pounds (80,000 kg) or more, in VTOL/Conversion mode, 110 EPNdB, decreasing linearly with the logarithm of the tiltrotors weight (mass) at a rate of 3.0 EPNdB per halving of weight (mass) down to 90 EPNdB, after which the limit is constant. Figure K4 illustrates the approach noise limit as a dash-dot line.

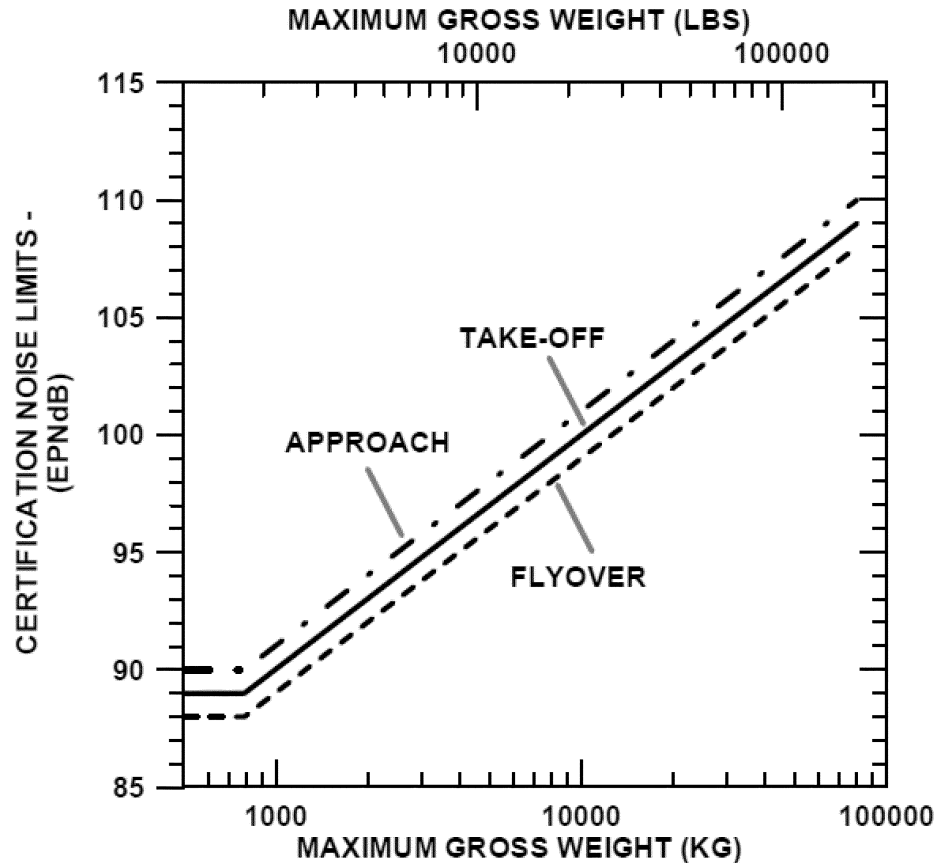


FIGURE K4.  
TILTROTOR NOISE LIMITS

#### Section K5 Trade-Offs

If the noise evaluation measurement exceeds the noise limits described in K4 of this appendix at one or two measurement points:

- (a) The sum of excesses must not be greater than 4 EPNdB;
- (b) The excess at any single point must not be greater than 3 EPNdB; and
- (c) Any excess must be offset by the remaining noise margin at the other point or points.

#### Section K6 Noise Certification Reference Procedures

##### K6.1 General Conditions

- (a)-(b) [Reserved]
- (c) The takeoff, flyover and approach reference procedures must be established in accordance with sections K6.2, K6.3 and K6.4 of

this appendix, except as specified in section K6.1(d) of this appendix.

(d) If the design characteristics of the tiltrotor prevent test flights from being conducted in accordance with section K6.2, K6.3 or K6.4 of this appendix, the applicant must revise the test procedures and resubmit the procedures for approval.

(e) The following reference atmospheric conditions must be used to establish the reference procedures:

- (1) Sea level atmospheric pressure of 2,116 pounds per square foot (1,013.25 hPa);
- (2) Ambient air temperature of 77 °Fahrenheit (25 °Celsius, i.e. ISA + 10 °C);
- (3) Relative humidity of 70 percent; and
- (4) Zero wind.

(f) For tests conducted in accordance with sections K6.2, K6.3, and K6.4 of this appendix, use the maximum normal operating RPM

corresponding to the airworthiness limit imposed by the manufacturer. For configurations for which the rotor speed automatically links with the flight condition, use the maximum normal operating rotor speed corresponding with the reference flight condition. For configurations for which the rotor speed can change by pilot action, use the highest normal rotor speed specified in the flight manual limitation section for the reference conditions.

**K6.2 Takeoff Reference Procedure.** The takeoff reference flight procedure is as follows:

(a) A constant takeoff configuration must be maintained, including the nacelle angle selected by the applicant;

(b) The tiltrotor power must be stabilized at the maximum takeoff power corresponding to the minimum installed engine(s) specification power available for the reference ambient conditions or gearbox torque limit, whichever is lower. The tiltrotor power must also be stabilized along a path starting from a point located 1,640 feet (500 m) before the flight path reference point, at 65 ft (20 m) above ground level;

(c) The nacelle angle and the corresponding best rate of climb speed, or the lowest approved speed for the climb after takeoff, whichever is the greater, must be maintained throughout the takeoff reference procedure;

(d) The rotor speed must be stabilized at the maximum normal operating RPM certificated for takeoff;

(e) The weight (mass) of the tiltrotors must be the maximum takeoff weight (mass) as requested for noise certification; and

(f) The reference takeoff flight profile is a straight line segment inclined from the starting point 1,640 feet (500 m) before to the center noise measurement point and 65 ft (20 m) above ground level at an angle defined by best rate of climb and the speed corresponding to the selected nacelle angle and for minimum specification engine performance.

**K6.3 Flyover Reference Procedure.** The flyover reference flight procedure is as follows:

(a) The tiltrotor must be stabilized for level flight along the centerline flyover flight path and over the noise measurement reference point at an altitude of 492 ft (150 m) above ground level;

(b) A constant flyover configuration selected by the applicant must be maintained;

(c) The weight (mass) of the tiltrotor must be the maximum takeoff weight (mass) as requested for noise certification;

(d) In the VTOL/Conversion mode:

(1) The nacelle angle must be at the authorized fixed operation point that is closest to the shallow nacelle angle certificated for zero airspeed;

(2) The airspeed must be  $0.9V_{CON}$  and

(3) The rotor speed must be stabilized at the maximum normal operating RPM certificated for level flight.

**K6.4 Approach Reference Procedure.** The approach reference procedure is as follows:

(a) The tiltrotor must be stabilized to follow a 6.0 degree approach path;

(b) An approved airworthiness configuration in which maximum noise occurs must be maintained;

(1) An airspeed equal to the best rate of climb speed corresponding to the nacelle angle, or the lowest approved airspeed for the approach, whichever is greater, must be stabilized and maintained; and

(2) The tiltrotor power during the approach must be stabilized over the flight path reference point, and continue as if landing;

(c) The rotor speed must be stabilized at the maximum normal operating RPM certificated for approach;

(d) The constant approach configuration used in airworthiness certification tests, with the landing gear extended, must be maintained; and

(e) The weight (mass) of the tiltrotor at landing must be the maximum landing weight (mass) as requested for noise certification.

#### Section K7 Test Procedures

##### K7.1 [Reserved]

**K7.2** The test procedures and noise measurements must be conducted and processed to yield the noise evaluation measure designated in section K2 of this appendix.

**K7.3** If either the test conditions or test procedures do not comply to the applicable noise certification reference conditions or procedures prescribed by this part, the applicant must apply the correction methods described in section H36.205 of Appendix H of this part to the acoustic test data measured.

**K7.4** Adjustments for differences between test and reference flight procedures must not exceed:

(a) For takeoff: 4.0 EPNdB, of which the arithmetic sum of delta 1 and the term  $-7.5 \log(QK/QrKr)$  from delta 2 must not in total exceed 2.0 EPNdB;

(b) For flyover or approach: 2.0 EPNdB.

**K7.5** The average rotor RPM must not vary from the normal maximum operating RPM by more than  $\pm 1.0$  percent throughout the 10 dB-down time interval.

**K7.6** The tiltrotor airspeed must not vary from the reference airspeed appropriate to the flight demonstration by more than  $\pm 5$  kts ( $\pm 9$  km/h) throughout the 10 dB-down time interval.

**K7.7** The number of level flyovers made with a head wind component must be equal to the number of level flyovers made with a tail wind component.

**K7.8** The tiltrotor must operate between  $\pm 10$  degrees from the vertical or between  $\pm 65$  feet ( $\pm 20$  m) lateral deviation tolerance,

whichever is greater, above the reference track and throughout the 10 dB-down time interval.

**K7.9** The tiltrotor altitude must not vary during each flyover by more than  $\pm 30$  ft ( $\pm 9$  m) from the reference altitude throughout the 10 dB-down time interval.

**K7.10** During the approach procedure, the tiltrotor must establish a stabilized constant speed approach and fly between approach angles of 5.5 degrees and 6.5 degrees throughout the 10 dB-down time interval.

**K7.11** During all test procedures, the tiltrotor weight (mass) must not be less than 90 percent and not more than 105 percent of the maximum certificated weight (mass). For each of the test procedures, complete at least one test at or above this maximum certificated weight (mass).

**K7.12** A tiltrotor capable of carrying external loads or external equipment must be noise certificated without such loads or equipment fitted.

**K7.13** The value of  $V_{CON}$  used for noise certification must be included in the approved Flight Manual.

[78 FR 1139, Jan. 8, 2013]

## PART 39—AIRWORTHINESS DIRECTIVES

Sec.

39.1 Purpose of this regulation.

39.3 Definition of airworthiness directives.

39.5 When does FAA issue airworthiness directives?

39.7 What is the legal effect of failing to comply with an airworthiness directive?

39.9 What if I operate an aircraft or use a product that does not meet the requirements of an airworthiness directive?

39.11 What actions do airworthiness directives require?

39.13 Are airworthiness directives part of the Code of Federal Regulations?

39.15 Does an airworthiness directive apply if the product has been changed?

39.17 What must I do if a change in a product affects my ability to accomplish the actions required in an airworthiness directive?

39.19 May I address the unsafe condition in a way other than that set out in the airworthiness directive?

39.21 Where can I get information about FAA-approved alternative methods of compliance?

39.23 May I fly my aircraft to a repair facility to do the work required by an airworthiness directive?

39.25 How do I get a special flight permit?

39.27 What do I do if the airworthiness directive conflicts with the service document on which it is based?

AUTHORITY: 49 U.S.C. 106(g), 40113, 44701.

SOURCE: Doc. No. FAA–2000–8460, 67 FR 48003, July 22, 2002, unless otherwise noted.

### § 39.1 Purpose of this regulation.

The regulations in this part provide a legal framework for FAA's system of Airworthiness Directives.

### § 39.3 Definition of airworthiness directives.

FAA's airworthiness directives are legally enforceable rules that apply to the following products: aircraft, aircraft engines, propellers, and appliances.

### § 39.5 When does FAA issue airworthiness directives?

FAA issues an airworthiness directive addressing a product when we find that:

(a) An unsafe condition exists in the product; and

(b) The condition is likely to exist or develop in other products of the same type design.

### § 39.7 What is the legal effect of failing to comply with an airworthiness directive?

Anyone who operates a product that does not meet the requirements of an applicable airworthiness directive is in violation of this section.

### § 39.9 What if I operate an aircraft or use a product that does not meet the requirements of an airworthiness directive?

If the requirements of an airworthiness directive have not been met, you violate § 39.7 each time you operate the aircraft or use the product.

### § 39.11 What actions do airworthiness directives require?

Airworthiness directives specify inspections you must carry out, conditions and limitations you must comply with, and any actions you must take to resolve an unsafe condition.

### § 39.13 Are airworthiness directives part of the Code of Federal Regulations?

Yes, airworthiness directives are part of the Code of Federal Regulations, but